



Do women react differently to incentives? Evidence from experimental data and payroll records

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Abstract

We consider the response to incentives as an explanation for observed productivity differences within a firm that paid its workers piece rates. We provide a framework within which the observed productivity differences can be decomposed into two parts: One due to differences in ability and the other due to differences in the response to incentives. We apply this decomposition to male and female workers from a tree-planting firm in British Columbia, Canada. Our evidence (both experimental and nonexperimental) suggests that there was no difference in the reaction to incentives between male and female planters. The productivity differential male planters enjoyed arose because of differences in ability, interpreted as strength in our application.

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1. Introduction and motivation

Economists have shown great interest in measuring and explaining differences in the labour market performance between men and women. Traditionally, attention has focused on the earnings premium enjoyed by men and its relationship to productivity differences;

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see, for example, [Gunderson \(1989\)](#). Following [Oaxaca \(1973\)](#), the empirical implementation of human capital models permits the decomposition of the earnings premium in two parts: One explained by differences in economic characteristics and the other a residual. Empirical results indicate that the residual is important; see [Blau et al. \(1998\)](#). While these results are consistent with labour market discrimination, they may also reflect behavioural differences between groups; see [Bowles et al. \(2001\)](#). Men and women may differ with respect to motivation and aggressiveness, unobservable attributes that could be reflected in labour market outcomes; see [Becker \(1985\)](#) as well as [Hakim \(2000\)](#).

In this paper, we develop a framework that allows us to test for differences in motivation, the response to incentives, between men and women. We show that productivity differentials can be decomposed into differences in ability and differences in the response to incentives. We apply this decomposition to experimental and nonexperimental data concerning men and women working in a tree-planting firm located in the province of British Columbia, Canada.

The workers in this firm are paid using piece-rate incentive contracts: Payment is strictly proportional to individual worker productivity, the number of seedlings planted per day. Our data set contains information concerning daily worker productivity and the piece rate received per seedling planted as well as worker characteristics—gender and age. On average, male planters are more productive than female planters, by about 10%. Since this difference is conditional on planting conditions and the piece rate, we dismiss discrimination as an explanation and concentrate on inherent productivity differences between men and women. We exploit variation in the piece-rate to estimate the degree to which the observed productivity differential arises because of differences in the response to incentives.

Payroll records containing variation in observed contracts coupled with information on actual productivity provide promising data from which to measure the response to incentives.¹ Yet the variation in contracts observed within payroll records is typically not exogenous: The particulars of a contract are choice variables of firms. If elements (unobserved by the econometrician) affect the choice of contract as well as worker productivity, then the observed covariation between the contract and productivity will confound incentives with changes in unobservables: Reduced-form regression methods cannot identify the incentive effect.²

Tree-planting firms choose the piece-rate as a function of planting conditions that are unobserved by the econometrician, yet affect worker productivity. Blocks of land to be planted are inspected in advance by the firm. Generally, the steeper is the terrain, or the greater is underbrush or rock on the ground, the more difficult it is to plant and the lower will be worker productivity and thus earnings. Since the contract with the workers contains only one instrument (the piece rate) it must perform multiple tasks—motivating workers and inducing workers to plant under different conditions. Consequently, as planting conditions become more difficult, the firm raises the piece rate to meet the labour-supply

¹Methodologically, this approach is closely related to that in research concerned with measuring the impact of compensation systems on worker productivity; see [Bull et al. \(1987\)](#), [Paarsch and Shearer \(1999, 2000, 2005\)](#), [Lazear \(2000\)](#), [Haley \(2003\)](#), and [Shearer \(2004\)](#).

²Recent evidence points to the importance of endogeneity within this setting; see [Paarsch and Shearer \(1999\)](#) and [Haley \(2003\)](#) as well as [Bandiera et al. \(2004\)](#) who have all investigated the setting of piece rates in three separate industries—tree planting, timber logging, and fruit picking. In all cases, the piece-rate was chosen as a function of economic conditions affecting productivity.

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